Problem Resolution Report

COSD Contract no. 537863
Immutable Storage
HP/CoSD-088

Date: September 26, 2012

Summary:

In accordance with the provisions of the IT and Telecommunications Service Agreement by and between the County of San Diego ("County") and HP Enterprise Services, LLC ("HP" or "Contractor") (hereinafter collectively referred to as "the Parties") originally dated January 24, 2006 and restated on April 5, 2012 ("the Agreement"), agreement is reached on the date shown above.

Issue or Problem:

Immutable storage has only been available to Assessor Recorder County Clerk (ARCC) since this department paid for a 26-TB immutable storage frame for its own use. The storage arrays were refreshed in 2011 and now have 70 TB of usable space, which is more than required by ARCC. Other County departments and programs would like to take advantage of the available immutable storage.

Resolution:

1. Establish a new Resource Unit for Immutable Storage available in 1TB and 500GB increments, which will replace the RU for Immutable Storage currently used:

Immutable Storage:	1 TB	Monthly Fee $1,100.00
	500 GB	Monthly Fee $ 570.00

2. Immutable Storage will be allocated with a 500GB minimum. It may be ordered, increased or decreased in 500GB or 1TB increments.
3. The monthly fee is dependent upon the allocation and not upon the actual storage consumed.
4. Immutable storage is replicated between the two County data centers. The Resource Unit Fee includes the replication and replicated storage.
5. Section 6.8, Storage Services, of the Statement of Work of the Agreement is amended as shown here in Attachment 1 to this PRR to provide updated requirements for Immutable Storage.
6. Exhibit 16.1-1 is hereby amended to replace the Immutable Storage Resource Unit Fee with the Resource Unit Fee as shown in Attachment 2 to this PRR;
7. Exhibit 16.1-2 is hereby amended to replace the RU Fee decomposition with the Resource Unit Fee Decomposition as shown in Attachment 3 to this PRR.

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The resolution of the issue or Problem as described in this Problem Resolution Report shall govern the Parties' actions under the Agreement until a formal amendment of the Agreement is implemented in accordance with the terms of the Agreement, at which time this Problem Resolution Report shall be deemed superseded and shall be null and void.

All other terms and conditions of the Agreement remain unchanged and the Parties agree that such terms and conditions set forth in the Agreement shall continue to apply. Unless otherwise indicated, the terms used herein shall have the same meaning as those given in the Agreement.

IN WITNESS WHEREOF, The Parties hereto, intending to be legally bound, have executed by their authorized representatives and delivered this Problem Resolution Report as of the date first written above.

COUNTY OF SAN DIEGO	**HP ENTERPRISE SERVICES, LLC**
By: Bruce Petrozza	By:
Name: Bruce Petrozza	Name: Max Pinna
Title: Manager, Contracting	Title: Contracts Manager
Date: 10-02-12	Date: September 26, 2012

J. Hudson

ATTACHMENT 1 to PRR 88 – IMMUTABLE STORAGE

6.8 Storage Services

6.8.1 Storage Services Overview

This section pertains to the Storage Services component within the Data Center Services Framework. There are three primary categories of data storage:

6.8.1.1 Attached Storage –Applies to all storage used to store End-user Data that is directly attached to a physical Application Server and includes Mainframe, VAX, VMS, AS/400, UNIX and WINTEL Application Servers.

6.8.1.2 Shared Storage Services - this applies to a centralized and consolidated storage environment for End-user Data and includes Storage Area Network (SAN), and Network Attached Storage (NAS).

6.8.1.3 Immutable Storage – this applies to a dedicated storage environment for maintaining a legal copy of records that are not modifiable or changeable, they are immutable (for example the County's Assessor Recorder County Clerk (ARCC) Recording System). This environment will be replicated between the two data centers to further meet legal requirements. Immutable storage consists of two (2) storage systems, one deployed in the Plano data center and one deployed in the Tulsa data center. The current configuration will support Bi-direction replication. Bi-directional replication allows user to write to either of the two storage systems and have data copied to the other, therefore data written on storage system A in Tulsa will be replicated to storage system B in Plano and vice versa.

Immutable Storage will be dedicated to the County of San Diego, and not leveraged with any other non-County client

Services provided within the Storage Services component include, but are not limited to, end-user access, recovery (via backup and replication) of all Storage Services assets, data protection, storage reporting to the business unit, low org or end-user, storage capacity analysis, and storage management. In addition, services provided within the Storage Services include, but are not limited to, storage consolidation, tiered storage and migration from Attached Storage to centralized Storage Services where appropriate.

Attached Storage is the directly attached storage that resides on legacy Application Servers. The purpose of this storage type is for those Application Servers that exist in the environment, will not be immediately refreshed and contain End-user data. As

Application Servers are refreshed End-user data will be migrated from Attached Storage to Shared Storage unless there are specific technical reasons why the End-user data must remain on Attached Storage.

The Shared Storage Services infrastructure shall be a centralized, integrated, tiered repository for County generated data. The purpose of the Shared Storage Services infrastructure is the elimination of storage underutilization, avoidance of "islands of storage", a decrease in overall recovery time and efficiency of storage administration and management (including management of storage capacity). Application Servers, as they are refreshed or newly acquired, shall be integrated into the Shared Storage Services infrastructure.

Shared Storage Services will be broken down into levels or types of storage.

- Level 1 will be high-performing storage technology with a high degree of I/O performance, and will contain mission critical data for business operations.
- Level 2 will be low cost, high capacity storage that does not require a high degree of I/O performance and/or is viewed as non-mission critical to business operations and may be considered near-line storage.
- Level 3 Storage – Shared Immutable Storage is replicated storage for the lifecycle management of records that are not to be modified.Tier III is archive storage managed through a File Management Appliance (FMA). The FMA provides automated policy management to move files to lower cost storage destinations.

The current configurations for each of the Level 1 and Level 2 and Tier III storage services utilize a shared SAN and backup environment. The specific service definitions are listed below. Changes to these configurations will be mutually agreed upon over the term of the contract as technology changes.

- Level 1 Storage – Shared Storage Environment using– Raid 5 High Performance Drives

- Level 2 Storage – Shared Storage Environment using– Raid 5 Lower Performance Drives

- Level 3 Storage – Shared Immutable Storage using the replicated immutable storage devices as approved by the County

- Tier III Storage – Shared Storage Environment using low cost network storage devices as approved by the County.

Storage Services will be measured by installed, usable capacity which does not include any data replication or other storage requirements necessitated by the Contractor's Disaster Recovery or backup and recovery solutions. The replication of immutable storage is not considered part of this exclusion since it is a required feature of this type of storage. The growth of storage capacity throughout the County needs to be predictable and managed. Unmanaged data growth should be eliminated throughout the storage infrastructure by implementing storage management and storage reporting. Additional capacity to the shared storage environment, by level, will be proposed by the Contractor and approved by the County.

6.8.2 Storage Services High Level Requirements

6.8.2.1 Develop a consolidated and centralized storage environment

6.8.2.2 Provide dedicated Content Addressed Storage (CAS) specifically for immutable data for the County of San Diego.

6.8.2.3 Implement storage management processes and procedures

6.8.2.4 Produce Storage Service reports by Storage type and level down to the business unit, department and End-user.

6.8.2.5 Enable efficient and effective Storage Services management reporting to the business unit, department and End-user

6.8.2.6 Implement centralized control and management of the Storage Services infrastructure

6.8.2.7 Lower hardware and software maintenance costs associated with Shared Storage Services

6.8.2.8 Manage data backups of Storage Services assets with the intent to decrease recovery time

6.8.2.9 Provide automated backups over a network connection to the backup site where required to meet recovery times

6.8.2.10 Provide secure and bonded transportation and offsite storage of backups

6.8.2.11 Attached Storage Services assets shall be refreshed on the same cycle as its associated Application Server unless migrated to Shared Storage

6.8.2.12 Shared Storage Services shall be refreshed at least every five (5) years based on Contractor's refresh schedule of the shared storage environment and upon prior notification to and approval of the County

6.8.3 Storage Services Environment

The Storage Services environment will include data from:

6.8.3.1 End-User Data

End-user Data would be the data generated by a County Portfolio Application used to deliver business value to the County or its customers and stored typically on Application Servers. Other End-user data are files generated by County End-users on Desktop Services assets using typically Office Automation tools such as Word, Excel and PowerPoint. This data is broken down into various types, such as, user home drives, department share drives, and enterprise share drives

6.8.3.2 Mainframe

Mainframe will continue to utilize DASD for storage requirements and will not be part of the centralized, consolidated shared storage environment

6.8.3.3 DEC VAX

DEC VAX will continue to utilize DASD for storage requirements and will not be part of the centralized, consolidated shared storage environment

6.8.3.4 VMS

Refreshed or newly acquired VMS based servers will be migrated into the Shared Storage Services. VMS based servers are refreshed at a rate of 20% a year, so the expectation is that Storage consolidation will be achieved within five (5) years.

6.8.3.5 AS/400

AS/400 will continue to utilize DASD for storage requirements and will not be part of the centralized, consolidated shared storage environment

6.8.3.6 Wintel

Refreshed or newly acquired Wintel Application Servers will be migrated into the Shared Storage Services. Wintel Application Servers are refreshed at a rate of 20% a year, so the expectation is that Storage consolidation will be achieved in no more than five (5) years

6.8.3.7 UNIX

Refreshed or newly acquired UNIX Application Servers will be migrated into the Shared Storage Services. UNIX Application Servers are refreshed at a rate of 20% a year, so the expectation is that Storage consolidation will be achieved in no more than five (5) years

6.8.3.8 CAS

Dedicated CAS environment will be utilized for County immutable storage requirements

6.8.4 Storage Services Requirements, Roles and Responsibilities

The following table identifies the Plan Build and Operate requirements, roles and responsibilities associated with Storage Services.

Storage Services: Plan, Build and Operate Requirements, Roles and Responsibilities		
Plan Requirements, Roles and Responsibilities	**Contractor**	**County**
1. Produce and submit recommendations on Shared Storage Services Architecture	X	
2. Review and approve recommendations on Shared Storage Services Architecture		X
3. Produce and submit plans on Shared Storage Services consolidation and Application Server migration to Shared Storage Service environment on a yearly basis	X	
4. Review and approve plans on Shared Storage Services consolidation and Application Server migration to Shared Storage Service environment on a yearly basis.		X
5. Produce and submit Storage Services management policies/procedures.	X	
6. Review and approve Storage Services management policies/procedures.		X
7. Produce and submit Storage Services reporting policies/procedures.	X	
8. Review and approve Storage Services reporting policies/procedures.		X
9. Produce and submit Storage Services policies and procedures	X	
10. Review and approve Storage Services policies and procedures		X
11. Produce and submit Storage Services refresh plan on a yearly basis	X	
12. Review and approve Storage Services refresh plan on a yearly basis		X
13. Produce and submit plans for meeting County Storage demands.	X	
14. Review and approve plans for meeting County Storage demands		X
15. Produce recommendations for process improvement in backup and recovery for Storage Services assets.	X	
16. Recommend and submit recovery policies/procedures for Storage Services assets.	X	
17. Review and approve recovery policies/procedures for Storage Services assets.		X
18. Produce and submit recommendation on capacity management	X	

Storage Services: Plan, Build and Operate Requirements, Roles and Responsibilities		
19. Review and approve recommendations on capacity management		X
20. Produce and submit plans to add additional Shared Storage	X	
21. Review and approve plans to add additional Shared Storage		X
22. Produce and submit a data management strategy that will make certain that commonly used data has a defined minimum set of characteristics that include the following: • Definition of the data object (what is it?) • Reference (where and how is the data object used?) • Metadata (data object attributes, such as type, size, and range of values) • Ownership and governance (who owns data, definitions, content, and so on?)	X	
23. Review and approve data management strategy		X
24. Implement that strategy using an Information Lifecycle Management (ILM) approach to storing the data. Service shall be delivered for the most prominent applications that benefit from early adoption of ILM.	X	
25. On an initial and ongoing basis, evaluate the County's data to identify redundancies, excess capacity, and opportunities for data consolidation using strategies such as data warehousing and data archiving. This rationalization will reduce the County's data storage costs through the following: • Leveraging centralized hardware • Reducing administrative costs by reducing the number of databases • Providing centralized data repository • Reducing costs by reducing under-utilized storage • Reducing and eliminating autonomous backup and recovery solutions for centrally administered and managed backup and recovery	X	
Build Requirements, Roles and Responsibilities	**Contractor**	**County**
26. Design and Implement recovery processes based on approved policies/procedures	X	
27. Design and Implement Storage management processes based on approved policies/procedures	X	
28. Implement Storage Services Reporting	X	
29. Design and Implement Storage consolidation based on approved recommendations.	X	
30. Deploy, manage, communicate and report on activities related to Storage Services refresh	X	
31. Review and approve Storage refresh report		X
32. Design and Implement Storage provisioning and allocation processes based on approved policies	X	
33. Design and implement capacity management	X	
34. Implement approved Storage Services policies and procedures	X	

Storage Services: Plan, Build and Operate Requirements, Roles and Responsibilities		
35. Implement necessary physical and logical security to protect the County's data (e.g. through access controls, storage network, and host-based allocation controls, SAN zoning and host/array-level logical unit (LUN) masking)	X	
Operate Requirements, Roles and Responsibilities	**Contractor**	**County**
36. Provide support, including break-fix, for all Storage Services assets	X	
37. Manage and support the Storage Services	X	
38. Produce and submit monthly Storage Services reports	X	
39. Review and approve monthly Storage Services reports		X
40. Support Storage Services refresh	X	
41. Perform and support media management activities for Storage Services	X	
42. Manage and support the media requests	X	
43. Perform tapes mounts as required	X	
44. Perform special tape shipments as requested	X	
45. Load and manage third-party media as required	X	
46. Prepare and manage media for use by microfiche service	X	
47. Manage and perform file transfers and other data movement activities related to break/fix or consolidation of Storage assets	X	
48. Perform data backups of Storage Services per approved policies and procedures	X	
49. Perform recovery processes on Storage assets	X	
50. Perform storage utilization management	X	
51. Manage and maintain all Storage assets and services	X	
52. Manage and maintain backup media library	X	
53. Manage and maintain the Storage Services Assets	X	
54. Produce and submit Storage Management Reports	X	
55. Review and accept Storage Management Reports.		X

ATTACHMENT 2 TO PRR 88 - IMMUTABLE STORAGE

SCHEDULE 16.1 - EXHIBIT 16.1-1

Resource Unit	Schedule 4.3 Cross-Reference/Service Framework Component **	Unit of Measure	Pricing	Decomposition (specific cost detail breakouts)	Resource Unit Fee (90% to 110% band)	Baseline Volumes (per Contract Year)	(Resource Unit Fee) x (Baseline Volume)	Bundled Resource Unit	Resource Unit Fee (70% to 80% band)	Resource Unit Fee (80% to 90% band)	Resource Unit Fee (110% to 120% band)	Resource Unit Fee (120% to130% band)	Measurement Methodology (Specific measurement on last day of month or cumulative use during month)	Depreciation Time Period (in Years)
Installed Level 3 - Immutable Storage System (1TB)	Data Center Services - Storage Services—Section 6.8	1TB	Unit	Hardware, operating system license, hardware maintenance, software maintenance	$ 1,100.00	30	$ 33,000	N/A	N/A	N/A	N/A	N/A	Specific	5
Installed Level 3 - Immutable Storage System (500 GB)	Data Center Services - Storage Services—Section 6.8	500GB	Unit	Hardware, operating system license, hardware maintenance, software maintenance	$ 570.00	30	$ 17,100	N/A	N/A	N/A	N/A	N/A	Specific	5

ATTACHMENT 3 TO PRR 88 - IMMUTABLE STORAGE

SCHEDULE 16.1, EXHIBIT 16.1-2

Resource Unit	Unit of Measure	Pricing	Decomposition (specific cost detail breakouts)	Resource Unit Fee	Component Fee		
Immutable storage	Per 1 Terabyte (TB)	Allocated Terabyte		$ 1,100.00			
			Hardware and Maintenance		$ 660.00		
			Software and Maintenance				
			Network Replication				
			Third Party Services				
			Operations & Support		$ 440.00		

Resource Unit	Unit of Measure	Pricing	Decomposition (specific cost detail breakouts)	Resource Unit Fee	Component Fee		
Immutable storage	Per 500 Gigabytes (GB)	Allocated Gigabytes		$ 570.00			
			Hardware and Maintenance		$ 342.00		
			Software and Maintenance				
			Network Replication				
			Third Party Services				
			Operations & Support		$ 228.00		